Summary

Governor Pete Wilson created the 1991 Drought Water Bank to mitigate the impact of an unprecedented fifth consecutive year of drought in California. California's Department of Water Resources (DWR) bought an estimated 821,000 acre-feet[1] of water for approximately $100 million from farmers, landlords, and water agencies in parts of central and northern California. Water was primarily purchased at $125 per acre-foot and then resold to urban and agricultural areas for $175 per acre-foot.

Even though the Bank injected a significant amount of money into the selling regions, concerns arose about the impact of water purchases on the economies of local communities. Firms that supply farm inputs and process or handle farm products were worried about the impact of the Bank on their businesses. Labor organizations were concerned about job losses by farm workers. County representatives were concerned about the impact on county revenue and on social service and welfare costs.

This study evaluates the economic impact of the 1991 Bank in the selling regions. We base our analysis on a survey of 99 farmers participating in the Bank and 65 agricultural firms that did business with farmers participating in the Bank. We develop a statistical methodology to isolate the impact of the Bank from the many other changes that were going on at the same time.

Principal Findings

The Bank reduced farm operating costs and crop sales substantially. We estimate that farmers participating in the Bank reduced operating costs by $17.7 million, or 11 percent, because of the Bank. We also estimate that crop sales for farmers in the Bank were $77.1 million, or 20 percent, lower in 1991 than they would have been had there been no Bank. These reductions adversely affected the suppliers of farm inputs and the handlers and processors of farm outputs.

The impacts of the Bank were not large when compared to the agricultural economy in the selling region. While these declines are sizable for the farmers

[1] An acre-foot of water is the amount of water needed to cover 1 acre to a depth of 1 foot. One acre-foot is approximately 326,000 gallons.

in the Bank, they are not large compared with total operating costs or crop sales in counties where water was sold to the Bank. We estimate that operating costs and crop sales dropped 2 and 3 percent, respectively, in selling counties because of the Bank. We estimate that revenues of agricultural businesses serving these counties fell a like amount.

The impacts of the Bank were not large compared to historic variation in the agricultural sector. We found that the estimated decline in the agricultural sector due to the Bank was not large compared to annual changes in agriculturally related personal income or agricultural employment during the 1980s in the selling region. It also appears that the additional decline due to the Bank did not cause the declines in agriculturally related personal income and agricultural employment between 1990 and 1991 to approach their maximum annual decline during the 1980s.

The negative impacts varied by type of contract. As expected, impacts were largest for contracts where farmers agreed not to irrigate crops. We found little change in operating costs for farmers with groundwater-exchange contracts, but in contrast to what many had expected, our findings suggest that crop sales fell for these farmers. This may be because groundwater was of lower quality than the surface water it replaced or because farmers did not fully offset surface water sales with groundwater pumping.

The negative impacts varied by crop put in the Bank. The impacts of the Bank on farm operating costs and crop sales varied substantially by crop. Water generated by not irrigating rice, sugar beets, and alfalfa had the largest impacts, per acre-foot sold, of the crops for which we could identify individual effects. Wheat and corn had intermediate impacts, and pasture had little impact.

Farmers who participated in the Bank increased farm investment. We estimate that farmers who participated in the Bank (both owner-operators and tenants) invested $5.7 million more in their farms than they would have had there been no Bank. We estimate that increased farm investment offset approximately 32 percent of the Bank-generated decline in farm operating costs. While farm investment caused the decline in the purchase of overall farm inputs to be lower than it would have been otherwise, the people and businesses that benefited from the increased farm investment are not necessarily the same ones hurt by decreased operating costs.

Farmers, landlords, and water agencies benefited from the Bank. We found that water sales for no-irrigation contracts increased farm net revenues $35 per

acre-foot over what they would have been had there been no Bank. The increase was less for groundwater-exchange contracts, but still positive.[2] This suggests that DWR could have found many willing sellers if the purchase price had been below $125 per acre-foot.

There was no detectable overall impact of the Bank in selling counties. The Bank injected a sizable amount of money into the selling regions, which would tend to offset the negative impacts of the Bank. We were unable to detect consistent or statistically significant relationships between the estimated negative impacts of the Bank and several measures of overall county economic activity.

Farmers and businesses thought the Bank should start earlier and be simpler to understand. Both farmers and businesses thought that the Bank should start earlier, so that they could better plan their operations. Several farmers thought that DWR should make the Bank easier to understand and simpler to participate in.

The Bank caused divisiveness in the local community. Many thought that the Bank caused increased divisiveness in the local community. Local businesses were resentful of farmers who sold water to the Bank. Conflicts between landlords and tenants arose over the right to sell water and the proceeds of Bank sales.[3] Conflicts also arose between several county governments and DWR over the negative impacts of the Bank on the county economy and the impacts of groundwater contracts on groundwater levels.

Lessons Learned for Future Banks

The findings of this study suggest several recommendations for future banks. These recommendations are made assuming that DWR, or perhaps another government agency, will continue to play a central role. However, we also present recommendations that address the government's role in water transfers.

Third-Party Impacts

Minimize crops in future banks with high impacts on operating costs and downstream processors. DWR should consider concentrating water purchases on low-impact crops. Some caution is necessary, however. To the extent that

[2]Because of the small sample size, there is considerable uncertainty about the impact of these sales on net revenues.

[3]Once DWR became aware of tenant and landlord conflicts, it attempted to include both in any negotiations to reduce conflicts and promote fairness.

input suppliers or output processors and handlers specialize in particular crops, concentrating bank purchases on a few crops may focus negative impacts on a narrow set of businesses and individuals. This effect would be magnified if the input suppliers or output processors are concentrated in a few geographic areas.

Spread purchases to diffuse negative economic impacts. We found that the negative impacts of the Bank varied substantially by county. We also have some anecdotal evidence that certain parts of some counties were much more adversely affected than others. To reduce negative impacts in any one area, DWR should spread purchases out as widely as possible.

Rotate farmers in future banks. Increases in farm investment partially offset the drop in operating costs caused by the Bank, but there is likely a limit to the amount of investment that a farmer will do on his or her farm. This suggests that DWR should limit how often or how much water a farmer could sell to future banks.

Do not assume that groundwater-exchange contracts have no adverse economic impacts. Our findings suggest that these contracts caused farm production to fall. This should be considered when targeting purchases in future banks.

Purchase Price and Contracting Procedures

Consider lowering the purchase price of water. Our findings suggest that DWR could have found many willing sellers at less than $125 per acre-foot. A lower price in 1991 may have caused fewer urban and agricultural buyers to withdraw their requests for water later in the year. However, farmers would have had less money available for farm investments and purchases of goods and services, which offset negative impacts in the local economy.

Start future banks as early as possible, and use standard rules and contracts. DWR could start signing some contracts in November or December, but this may be difficult if buyers are not willing to commit by then. An earlier start date might allow DWR to pay less for water, because some farmers will not have already incurred preplanting and planting costs. The flip side of this is that third-party impacts may well be higher, since farmers may purchase fewer inputs or harvest a reduced yield on land that is not irrigated during more of the season.

DWR could also publish, prior to negotiations, a list of rules governing enrollment and standardized contracts to reduce transaction costs and help farmers decide whether they want to participate.

Require more information about "black-box" contracts. DWR signed several contracts with water agencies that then made arrangements with individual farmers or landlords. DWR had very little information on these farm operations and was less able to monitor the source of water sold to the Bank and potential third-party impacts.

Develop procedures to ensure that both landlords and tenants are included. DWR could adopt criteria for future banks to ensure that tenants and landlords are dealt with fairly. This would ensure that the water sales did not come as a surprise to either party and would help reduce divisiveness caused by the bank.

Bank Evaluation

Continue to evaluate the economic impacts of the 1991 Bank. The negative impacts in the selling regions must be compared with the positive impacts in the buying regions.[4] Work also needs to be done on whether and how to compensate the parties negatively impacted by the Bank.

Broaden scope of evaluation. Questions about the overall design of the Bank should be raised. Examples of such questions include the following: (1) What role should DWR, or another government agency, play in the market? (2) Should the purchase and sales prices of future banks be centrally set[5] and fixed throughout the season? (3) Should DWR restrict water sales to areas with "critical" water needs, and, if so, how should "critical" be defined?

Water rights are not fully defined for users in many agricultural areas.[6] How to clarify water rights in a way that would facilitate transfers should be examined. The impact of the 1991 Bank on the environment and groundwater should also be considered.

Evaluate future banks. Our experience with the 1991 Bank is too limited to predict all of the economic consequences of future banks, which may be very different from the 1991 Bank. We recommend that DWR continue to evaluate the impact of future banks on local economies.

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[4]RAND is currently conducting a study on the impacts of the Bank in the buying regions. The report should be available in early 1994.

[5]The purchase price for the 1991 Bank was set by the Water Purchase Committee, which was made up of prospective buyers.

[6]Riparian and most groundwater rights are not quantified, and most appropriate rights are held by water agencies as a common pool for their members.

Collect information up front to evaluate future banks. To facilitate the evaluation of future banks, DWR should consider requiring information on changes in the participants' farm operations as part of the contract.